

Coastal Resource Management Project

BENEFITS AND COSTS OF CORAL REEF AND WETLAND MANAGEMENT, OLANGO ISLAND, PHILIPPINES

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Abstract

The Philippines has an estimated 27,000 km² of coral reef with only about 5 percent of this area still in excellent condition. Recent valuation studies indicate that reefs in the whole country are contributing a conservative US\$1.35 billion to the national economy and that one km² of healthy Philippine reef with some tourism potential produces annual net revenues ranging from US\$29,400 to US\$113,000. A case study of Olango Island, Cebu with 40 km² of poor quality coral reef is analyzed together with its wetland habitat and mangrove contribution. The current annual net revenue range from the Olango Island reef is US\$38,300 to 63,400 per km² or US\$1.53 to 2.54 million for the entire 40 km² reef area. Another US\$389,000 is added when wetlands are considered. This relatively high per km² and total amount of current revenue reflects the proximity of the Olango reef to Mactan Island, Cebu, a well-known tourist destination. The revenues accrue primarily from on and off site expenditures of diving tourists. Costs of managing Olango Island coral reefs and wetland habitats for improved net revenues (benefits) and conservation would amount to less than US\$100,000 per year. Cost and benefit analyses show that there is a very strong justification on the part of local and national government and private sector groups to invest in the management of reefs such as Olango Island. Improved reef quality and wetland stewardship on Olango could easily mean a 60 percent (US\$1.4 million) increase in annual net revenues from reef and mangrove fisheries and tourism expenditures.

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1. INTRODUCTION

The coastal ecosystems of the Philippines are some of the most productive and biologically diverse in the world. This diversity is associated with high primary productivity and high fishery yields. Coral reefs and their associated seagrass beds are among the most productive coastal ecosystems. The 27,000 square kilometers of coral reef and seagrass ecosystems in the Philippines, equal to slightly more than 10 percent of the total land area of the country, are of significant value in terms of fisheries for food security, coastal protection, tourism, education, research and aesthetic value (Gomez et al. 1994; Courtney et al. 1999; White 1987). Reef fisheries employ more than one million small-scale fishers (BFAR 1997). Unfortunately, these values are not always apparent or understood and they are rarely factored into planning for coastal resource management in monetary terms.

Coastal ecosystems in the Philippines are under severe stress from the combined impacts of human overexploitation, habitat destruction, pollution, sedimentation and general neglect (Chou et al. 1994; Junio-Menez and Newkirk 1995). Surveys in the 1980's and 1990s have shown that more than 75 percent of the coral reefs in the country have been degraded from human activities (Chou et al 1994; Gomez 1991; Gomez et al. 1994; Yap and Gomez 1985). As coral reefs are destroyed, fisheries, tourism, coastal protection and biodiversity values are all lost (Rubec 1988; Cesar 1996). These losses, expressed in thousands of dollars per year per km² of coral reef, have their greatest impact on local fishing communities and local tourism establishments. Such losses also reflect a general decrease in the recruitment of fish that could have emanated from damaged reef areas if they were still intact.

It has been estimated that the 27,000 km² of coral reefs in the Philippines, in their degraded condition in 1996, contributed a very conservative US\$ 1.35 billion to the Philippine economy (White and Cruz-Trinidad 1998). This figure includes values for fisheries, tourism and coastal protection analyzed in a similar manner to calculations by Cesar (1996) for Indonesian coral reefs.

The Philippine government with assistance from various donors is pursuing coastal resource management with the objective of reversing downward trends in the condition and productivity of its coastal ecosystems. Because of legislation in 1991 and 1998 that support devolution of authority to local government units in natural resource management, the common planning unit is that of municipal and city governments. These local government units (LGUs) are beginning to seriously consider the plight of their coastal resources and are developing coastal resource management plans. These plans require budgeting and support from the municipal or city councils but often lack economic justification to help the decision makers appreciate what they are supporting.

In this regard, there is an effort to raise awareness among the local and national government decision-makers about the values of coastal resources and what is lost if they are destroyed and not properly managed for long-term sustainability. This information helps justify investments in management and protection at a level of government that is directly concerned with its natural resource base.

The focus of this paper is the valuation of coastal resources in the Philippines and how this information can be used to improve planning for coral reef management within two LGUs in the Central Visayas (Lapu-Lapu City and Cordoba Municipality). The site analyzed, Olango Island, is rich in reef and wetland resources and is envisioned as an ecological tourism destination by government planners (Figure 1). Olango Island is representative of many coastal areas in the Philippines and parts of Southeast Asia with potentially rich coral reefs in need of improved management so that economic and other benefits can be restored and enhanced.

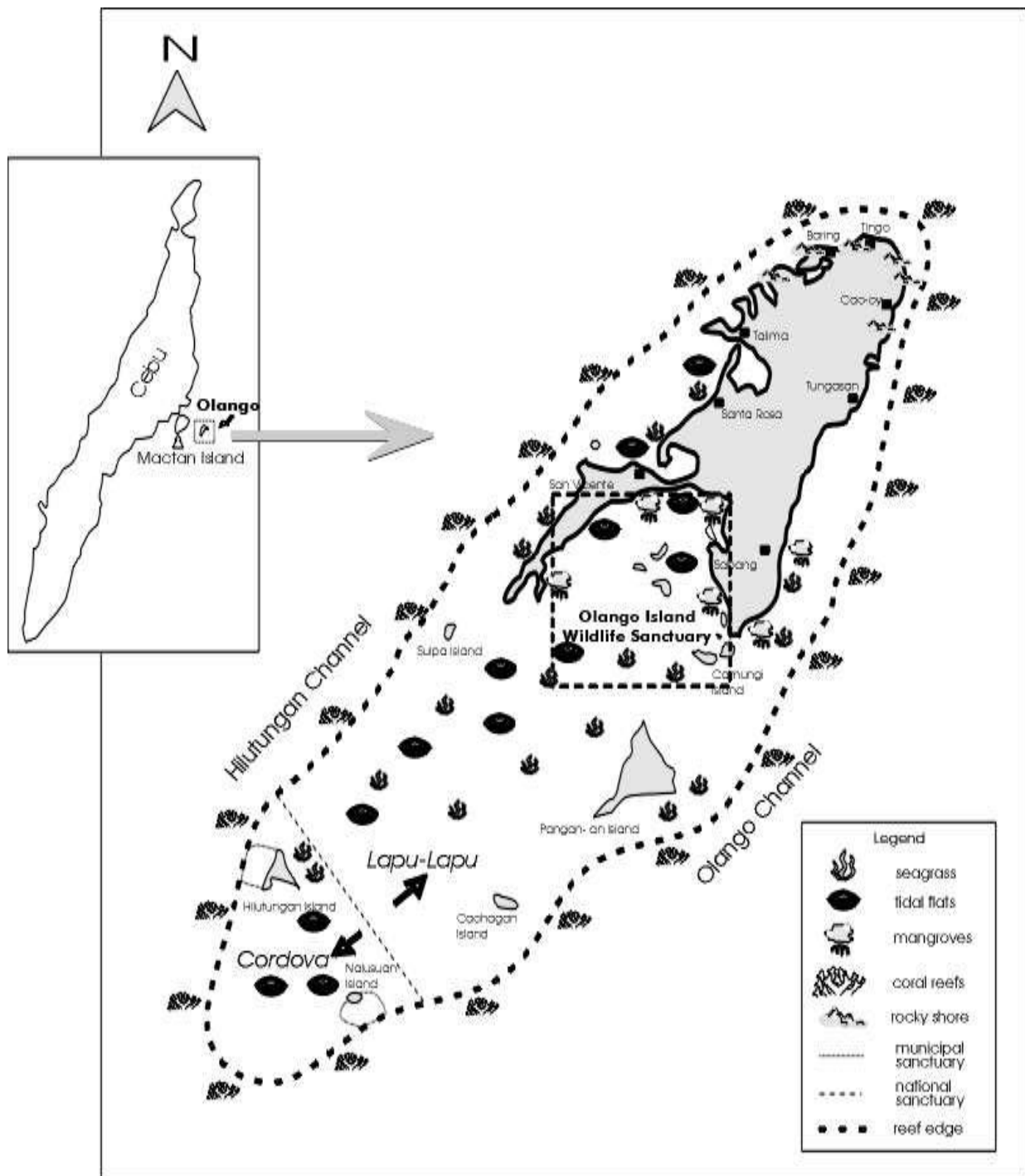


Figure 1. Olango Island coastal habitats and features and location in the Philippines

This case study introduces Olango Island, its resources and economic make-up as background for the economic valuation of its coastal resources. These economic values and net revenues or benefits are compared with the costs of management to improve the resource base and to enhance incomes from fishing and tourism industries dependent on the quality of the island's coastal habitats. Finally, the benefits and costs of coral reef and wetland management in Olango Island are analyzed to show the relatively high returns from small investments in management of coastal resources for the area.

2. OLANGO ISLAND AND ITS RESOURCES

Olango Island has a total land area of 1,041 hectares. Packed on this small land area are over 20,000 people, half of whom are under 18 years of age. Of the estimated 4,000 households, 75 percent are engaged in fishing or related livelihood activities, such as shell-craft, that are dependent on extraction of coastal resources (Parras et al. 1998). Although Olango lies only 5 km east of Mactan Island, Cebu, a major tourism destination with 250, 000 foreign arrivals annually, the residents realize little direct benefit from the influx of foreign exchange (Dumon 1999; DOT 1998). Basic infrastructure, such as water and waste disposal, are lacking despite close proximity to Cebu City, the second largest urban area in the Philippines.

The fisheries around Olango Island have long been depleted (Calumpong et al. 1997). Olango fishers' own assessment of the catch shows that the catch per fisher has dramatically decreased from about 20 kilograms per fisher per day in 1960 to less than 2 kilograms per fisher per day in 1998 (CRMP 1998). This decline is due to the use of destructive fishing practices and increased population pressure. For most of the fishers, Olango is the place they come home to after long periods at sea, traveling far and wide to scour new areas of the ocean for aquarium and food fish, abalone, squid and other marine products (Parras et al. 1998).

The number one problem for Olango Island inhabitants is poverty. This challenge could be met through proper use and management of its natural resource base. This low-lying limestone island is known for its extensive intertidal mudflats, wide fringing coral reefs and seagrass beds and mangroves (Figure 1). More than half of Olango is comprised of diverse coastal and marine habitats, part of which is a national bird sanctuary (Sotto et al. 2000).

2.1 Reefs, Seagrass Beds and Associated Fisheries

The combined cover of coral reefs and seagrass beds is about 4,000 hectares (40 km²). Not in excellent condition, Olango coral reefs are considered poor by Philippine standards with an average coral cover of about 20 percent (Calumpong 1997; Sotto et al. 2000). Surveys in the only active marine sanctuary on Gilutongan Island (part of the Olango Island reef complex) indicate an average coral cover of 40 percent. Coral cover and other parameters are shown in Table 1. The diversity of the Olango reefs is high. Seagrass beds are in good condition and represent important nursery grounds for fish. The main threat overall to the reef systems is overexploitation and a lack of management. Destructive fishing practices, although not totally stopped, have declined in recent years. But the level of fishing effort has not declined, so that reef associated fish yields of an estimated 5 tons per km² are way below their potential of at least 15 to 20 tons per km² per year as measured in high quality Philippine reef areas (White and Savina, 1987; Alcala and Russ 1990; Russ and Alcala 1996). Although the reef of Olango Island is in poor condition, the fish yield of 5 tons per km² can be maintained because illegal fishing has slowed and the reef is still diverse. The coral reefs of Olango hold tremendous potential for improved economic revenue generation if managed for sustainable use by reducing fishing effort.

Table 1. Olango Island coastal habitat distribution and condition

Habitat	Area ¹ (ha)	Condition (average % of live cover)
Coral reef		
Inshore reef flat	1,160	
Seagrass beds	1,756	Seagrass 44% (n=11) ¹
Outer reef	<u>1,083</u>	Coral 22% (n=22) ^{1, 2, 3}
	3,999	
Mangrove	424	19% natural stands (n=4) ¹ 78% reforested stands (n=2) ¹
Mudflat and others	38	
Sandy beach	60	
Rocky shoreline	53	
Olango Island Wildlife Sanctuary (mud and tidal flats and mangrove)	920	

Sources:

¹ CRMP, 1998² Calumpong et al., 1997³ Gomez et al. 1991; USC-MBS, 1988

2.2 Mangrove and wetland habitats

Wetland areas on Olango are comprised of mangrove forest with about 424 hectares (ha), mudflats (33 ha) and other shallow areas (53 ha) that serve as a bird habitat. The Olango Island Wildlife Sanctuary (OIWS) is a critical stopover for tens of thousands of birds traveling the East Asian Migratory Flyway. Included in the bi-annual “travelers” are a number of endangered and threatened bird species. The 920 hectares of tidal flats, mangroves, seagrass beds and sandy ridges are managed by the Department of Environment and Natural Resources through a locally constituted Protected Area Management Board with national and local government and non-government and private sector representatives. OIWS is an excellent resource and well cared for. But as for coral reefs, the OIWS wetland area is not reaching its potential to support economic benefits for the island residents or for the local and national government.

2.3 Tourism Potential

The number of visitors going to Olango Island on a daily basis for scuba diving and snorkeling averages about 80 persons per day traveling on 10 separate charter boats. At the present time, the main input to the island economy from these visitors is if they buy food or shell-craft from the islanders. In addition, many of the boat operators and their assistants come from Olango Island and support families on the island. The small (15 ha) marine sanctuary on Gilutongan Island recently completed an ordinance under the Municipality of Cordova to collect user fees of US\$ 1.25 for foreigners and US\$ 0.60 for Filipinos. This revenue accrues to the municipality and the island community in a sharing arrangement of 70:30 respectively. Most tourism revenues accrue to operators based in Lapu-Lapu City, Mactan Island where resorts with a total of about 1500 rooms, and boat owners are located (Schema 1996). The only exception is one resort on Nalusuan Island (part of the Olango Island complex) with 14 rooms.

The average expenditure of scuba divers staying on Mactan Island that visit Olango Island for the day is estimated to average about US\$ 30 per diving day for gear and boat rental plus US\$ 50 for room and food (Arin 1997). These amounts accrue to business owners on Mactan Island.

The user or entry fees collected in Gilutongan Island are presently minimal and can be expanded. A study in 1997 on willingness to pay among tourists staying on Mactan Island recorded a considerable willingness among scuba divers to pay for entry to marine sanctuaries that are well protected. They would pay on average about US\$ 5.34 to enter to scuba dive (P26=1 US\$) (Arin 1997). They also indicated that they would make donations for anchor buoy maintenance in an amount of \$US 5.31 per person per day (Arin 1997). This potential revenue is not yet being realized in Olango.

The OIWS receives visitors through two entrances. The Department of Environment and Natural Resources operated visitor center collected about US\$ 1,000 in 1999 from about 2000 visitors. In addition, the OIWS is receiving visitors who tour the area through a locally organized and community-based ecotourism group called the Olango Birds and Seascape Tour. In 1999, 357 tourists visited the Wildlife Sanctuary through this means and paid US\$ 8,500 to the Suba, Olango Ecotourism Cooperative. Of this amount, about US\$ 2,760 stayed in the community for salaries and wages and US\$ 1,480 accrued to Mactan Island based boats or tour organizers.

Other opportunities for tourism on Olango Island exist but the primary focus of this analysis is that of marine based coral reef tourism and the attraction of the bird life and wetland area as a form of community-based ecotourism.

2.4 Seaweed Farming

On the seagrass beds adjacent to Gilutongan Island and nearby Barangay Sabang, an area of about 40 ha has been developed for *Eucheuma* seaweed farming. This activity is fairly benign in terms of impact on the environment and employs 200 independent farmers that used to be fishers. Their average family farm size is 0.25 ha. Their total combined production of 1200 tons of dried seaweed per year is generating about US\$ 1,875 per family per year or US\$ 375,000 for all the farmers combined. This is a significant increase in the supplemental income earned from subsistence fishing on depleted reefs. This income from seaweed farming can be factored into the net revenues earned from coral reef areas while assuming the seaweed activity is controlled and not destructive to the seagrass habitat.

3. ECONOMIC VALUES OF OLANGO ISLAND COASTAL RESOURCES

3.1 Coral reefs and associated habitats

The sustainable annual net economic revenues per km² of a typical healthy coral reef in the Philippines, were calculated by White and Cruz-Trinidad (1998) (Table 2). The outcome is a range in potential annual net revenue from US\$ 29,400 to 113,000 per km² of high quality coral reef and associated habitat. The calculation includes only real and potential revenues occurring directly to the island community. It does not include off-island tourism expenditures. The production range for sustainable fisheries is based on studies of fish yields from around the Philippines and qualified by the condition of the coral reef under consideration (Alcala and Russ 1990; Russ and Alcala 1996; White and Savina 1987).

A calculation for current annual net revenues from the coral reef of Olango Island based on the conditions and situation at Olango Island is shown in Table 3. This set of net revenues (with costs deducted) is based on the relative condition of the coral reef for fisheries, tourism, and appropriate seaweed farming. The net revenues from fisheries are lower than the better quality coral reef used to calculate the revenues of Table 2. In contrast, the net revenues from tourism are relatively high for Olango because of its proximity to an urban, and major tourism center, and because the calculation includes off-island tourism expenditures. Off-island expenditures are included because of the importance of this revenue in relation to the existence of the coral reef at Olango. If the quality of the coral reef on Olango were to improve, both fisheries and tourism could benefit and provide an increase in future revenues.

Table 2. Sustainable annual net economic revenues (direct and indirect) per km² of typical healthy coral reef in the Philippines with tourism potential (White and Cruz-Trinidad 1998)

Resource use	Production range	Potential annual revenue (US\$) (range)
Sustainable fisheries ^a (local consumption)	10 to 30 ton	12,000 – 36,000
Sustainable fisheries ^b (live fish export)	0.5 to 1 ton	4,000 – 8,000
Tourism ^c (on-site residence)	100 to 1,000 persons	3,000 – 30,000
Tourism ^d (off-site residence)	500 to 1,000 persons	3,000 – 6,000
Coastal protection ^e (prevention of erosion)		5,000 – 25,000
Aesthetic/Biodiversity Value ^f (willingness-to-pay)	600 to 2,000 persons	2,400 - 8,000
Total		29,400 - 113,000

Assumptions:

^a Average market price of US\$1.5/kg of reef fish less production cost of 20 percent (Bureau of Agricultural Statistics (BAS). 1993.; White and Savina 1987)

^b Average market price to fishers of US\$10/kg of live reef fish less production cost of 20 percent (Barber and Pratt 1997)

^c Average expenditure of US\$50/day/tourist staying at the site assuming a 60% profit margin (pers. observaton; Vogt 1997; Cesar 1996)

^d Average expenditure of US\$10/day/tourist for purchases at the site assuming a 60% profit margin (Vogt 1997; A. White, pers. obs.)

^e Physical protection value of US\$5,000-25,000/km/year of reef front beach (Cesar 1996)

^f Average expenditure of US\$4/day for entrance to marine sanctuary or for a donation to the maintenance of the area or anchor buoys with no costs assumed (Arin 1997)

Table 3. Current (1999) annual net economic revenues (direct) per km² of coral reef and associated habitat in Olango Island

Resource use	Production range (per km ²)	Annual revenue (US\$) (range)
Sustainable fisheries ^a (local consumption)	4 to 6 ton	4,800 - 7,200
Sustainable fisheries ^b (live fish export)	0.2 to 0.4 ton	1,600 - 3,200
Tourism ^c (on-site residence)	25 - 50 persons	900 – 1800
Tourism ^d (off-site residence and expenditures)	500 – 800 persons	24,000 – 38,400
Tourism ^e (off-site residence – on-site expenditures)	500 – 800 persons	3,000 – 4,800
Seaweed farming ^f (farming revenue from 40 ha)	20 - 40 ton	4,000 – 8,000
Coastal protection ^g	Not available	
Aesthetic/Biodiversity value ^h	Not available	
		38,300 – 63,400
	For entire Olango Island reef area of 40 km ² =	1,532,000 – 2,536,000

^a Average market price of US\$1.5/kg of reef fish less production cost of 20 percent; production range based on condition of the Olango reef in relation to known fish yields from other reefs (Bureau of Agricultural Statistics (BAS) 1993; White and Savina 1987)

^b Average market price to fishers of US\$10/kg of live reef fish less production cost of 20 percent (Barber and Pratt 1997)

^c Average expenditure of US\$60/day/diving tourist staying at the site assuming a 60% profit margin (Nalusuan Island Resort) (Cesar 1996)

^d Average expenditure of US\$80/day/diving tourist staying on Mactan Island assuming a 60% profit margin including boat rental and gear (Cesar 1996)

^e Average expenditure of US\$10/day/diving for souvenirs or food on site assuming a 60% profit margin

^f Average revenue of US\$250/ton of dried seaweed production assuming 80% profit margin

^g This is not quantified because only direct net revenues are being considered

^h This is not quantified because no net transfers from fees, donations are yet being collected from coral reef use or visitation

The current annual net revenue range of US\$ 38,300 to 63,400 per km² of coral reef or US\$1.53 million to 2.54 million for the entire 40 km² Olango Island coral reef area is significant and reflects the relatively large expanse of coral reef compared to island land area. It also reflects the large amount spent to stay on Mactan Island while making day visits to Olango. It should also be noted that no “potential” or “indirect” benefits or revenues are included. Such indirect benefits and other revenue streams such as fees, taxes, donations or simply more scuba divers would be possible with more active management and promotion of the area as a quality diving destination with better reefs.

3.2 Wetland areas other than coral reefs (mangrove and mudflats)

Olango Island is unusual because in addition to its diverse coral reef habitats, it has productive mangroves and mudflats that attract significant numbers of migratory birds traveling along the East Asia Migratory Flyway twice a year. The economic values and benefits derived from these areas are distinct from those associated with reefs and are dealt with separately.

In the Philippines, various studies have shown that the direct and measurable sustainable benefits from mangroves come in the form of fish catch and wood harvested. These annual net revenues are slightly more than US\$600 per hectare for fairly marginal, not pristine stands of mangroves, from two net revenue streams from wood products (US\$90) and fishery products (US\$538) (Schatz 1991; White and Cruz-Trinidad 1998). A summary of mangrove ecosystem value averages from the around the world by Costanza et al. (1989) is much higher at US\$ 3,294 per hectare per year but will not be used because there is no supporting research for Philippine mangroves other than benefits measured with market values. In addition to the potential revenue derived from the mangroves on Olango is tourism supported by the bird habitat of the associated mangrove mudflats and the protected and unpopulated areas of the OIWS. This is based on the average annual number of visitors and what they spend as shown in Table 4. The range of annual net revenues from these wetland resources is also significant and can be factored into management planning for the island.

Table 4. Current (1999) annual net revenues per hectare of wetland (mangrove and other) on Olango Island

Resource use	Production range	Potential annual net revenue (US\$) (range)	
	Per hectare	Per hectare	Total
Sustainable wood harvest ^a (average from 424 ha of mangroves)	3 - 4 cubic meters	36 - 48	15,260 - 20,350
Sustainable fisheries ^b (mangrove associated species)	600 - 750 kg	480 - 600	203,500 - 254,400
Tourism ^c (for 920 ha sanctuary) (entry through DENR visitor center)	2.2 - 2.7 persons	13.2 – 16.2	12,144 – 14,904
Tourism ^d (for 920 ha sanctuary) (entry through Olango Bird and Seascape Tour)	0.4 - 0.5 persons	7.2 – 9.0	6,624 – 8,280
Tourism ^e (for 920 ha sanctuary) (off-island expenditures for bird tour guests)	2.5 - 3 persons	120 – 144	110,400 – 132,480
		656.4 – 814.2	
	Mangrove production		218,780 - 274,750
	Tourism to sanctuary		129,168 – 155,664
	Total revenue from wetland area		347,948 – 430,414

^a Average revenue of US\$12/m³ of wood after production costs (Schatz 1991)

^b Average market price of US\$0.80 of mangrove associated fish after production costs (Schatz 1991)

^c Average expenditure of US\$10/person including fee, local transport and food assuming 60% profit margin

^d Average expenditure of US\$30/person including boat transport and food assuming 60% profit margin

^e Average expenditure of US\$80/person/day staying on Mactan Island assuming 60% profit margin

4. COSTS OF MANAGEMENT FOR LOCAL GOVERNMENT AND COLLABORATORS

Olango Island is attracting increasing attention because of its “potentially” rich resource base; however, increasing tourism and resource use conflicts indicate the need for improved coastal resource management. There are ongoing projects to assist the local governments with planning and conservation activities affecting both the reef and wetland systems and the people that use these resources. A framework for the coastal resource management (CRM) process in Olango includes an island-wide management committee, zoning for resource use, law enforcement, environmental education, community-level assessments and planning, and provision for sustainable tourism development. This CRM process for Olango is long-term and involves a number of parallel activities that engage local residents, their government and other stakeholders in implementation. Although these ongoing activities do not require large investments of budget, they require continued support and proper technical guidance and mentoring through local and national government institutions. Investment for infrastructure is required for the OIWS to maintain the visitor center, as well as planned tourist reception areas and the necessary boats and equipment for local law enforcement.

The annual costs required for management to improve and maintain the condition of the coral reefs and wetland areas of Olango Island are summarized in Table 5. The essential activities that can easily be appraised include: resource assessments; community organizing, education and training; law enforcement and information dissemination; and various activities for macro and local planning and implementation. These costs are based on experience in other parts of the Philippines and are considered to be part of a local government basic service provided on a regular basis to maintain and improve the coastal resources for the Olango area. Although some of these activities have been started by the CRMP, they are not yet part of the local government support system.

Table 5. Estimated annual costs required to support coastal resource management in Olango Island¹

Olango Island Wide Management Costs¹	
Resource assessments and monitoring	US\$
Two reef surveys (2 x US\$2,000)	4,000
Two wetland surveys (2 x US\$2,000)	4,000
Community organizing	
4 CO's full-time working with communities (US\$4,000/person/year)	16,000
Education and training	
12 Seminars	12,000
Education and training materials	3,000
Law enforcement	
1 full-time patrol boat, crew and maintenance	10,000
Information dissemination	
Weekly radio broadcasts	2,000
12 Public meetings	6,000
Visitor centers (2) (annualized over 10 years)	3,000
Planning activities	
1 full-time CRM planner and technical guide	6,000
4 Planning workshops (US\$1,000/workshop)	4,000
	70,000
Gilutongan Marine Sanctuary (1 km²) Operations and Maintenance Costs²	
Reef surveys, monitoring and buoy maintenance	2,000
Community organizing	3,500
Education and training	3,500
Planning and resource center (annualized over 10 years)	1,000
Law enforcement (small patrol boat)	3,000
Information dissemination	2,000
Planning and operation	
1 full time Project Director (on site)	3,000
Honorarium for part time community staff	3,000
Municipal LGU staff and advisory group support	1,000
	21,000

¹ This amount is intended to cover the Olango Island complex and considered to be a minimal amount to maintain the area. The actual expenditures of the two LGUs combined is currently about US\$6,000/year. The average CRM expenditures in the 29 LGUs that the Coastal Resource Management Project is directly involved with in the Philippines is US\$5,000/year. The actual annual expenditure of the CRMP for Olango Island management in addition to the LGU expenditures is US\$65,000 plus overhead costs. In addition, the LGUs do collect some taxes to offset expenses such as US\$500 from the Nulusuan Resort in 1999.

² This amount is intended to support active management of the marine sanctuary, an area that is more heavily used than the larger Olango Island-wide reef area.

5. BENEFITS AND COSTS OF REEF MANAGEMENT IN OLANGO ISLAND

We now have a good idea about the potential net revenues (benefits) derived from the island resources on Olango and a sense about the costs of maintaining and improving the resource condition. Although our information base is not perfect and constantly changing, our assumptions are conservative and the figures quoted are based on actual revenue flows. Data on tourism, documented fish yield levels and market prices and actual costs of management, or on estimated potential revenues and costs based on other similar situations in the Philippines have been used in the benefit and cost calculations.

5.1 Benefit and cost analysis: Can investment in management be justified?

From the perspective of the two local governments in charge of Olango Island, they want to know how much they should spend every year to improve the resource condition and management thereof and what will be the potential returns from such spending. Through donor-assisted projects such as the Coastal Resource Management Project (CRMP) that works in Olango Island, the community-based process for conserving the resources is becoming known and accepted. The big question is whether the local governments can afford to support such conservation activities in the long term through their budget planning and allocation process. Since the responsibility lies with the local governments, they need to justify their budgets in terms that taxpayers and government planners can understand. The following benefit-cost framework portrays this basic information in a manner that can be readily used by national and local planners.

The annual net revenues (benefits) derived from the resources of primary concern with and without management interventions on Olango Island are summarized in Table 6. These benefits are compared with the cost of management and protection. The incremental annual benefit from management of US\$1.45 million more than justifies the cost of US\$91,000 for island-wide management. Since there are two LGUs involved, each will need to make their own calculations about the resources within their own jurisdiction and the needs for management.

Table 6. Summary of annual net revenues (benefits) (1999) and potential net revenues with management after five years from coral reef and wetland resources of Olango Island and the associated costs of management

ANNUAL REVENUES			
Sources	Area	Current net revenue ¹ (US\$)	Potential net revenue with management after 5 years ²
Coral Reef	40 km²		
Fisheries		336,000	672,000 ^a
Tourism		1,458,000	2,187,000 ^b
Seaweed farming		240,000	240,000 ^c
Coastal protection		0	0 ^d
Aesthetic/Biodiversity values		0	82,000 ^e
Subtotal		2,034,000	3,181,000
Wetland (mangrove and other)			
Fisheries	424 ha	229,000	458,000 ^a
Wood	424 ha	18,000	18,000 ^f
Tourism	920 ha	142,000	214,000 ^b
Subtotal		389,000	690,000
Total		2,423,000	3,871,000
ANNUAL COST OF MANAGEMENT			
Estimated island-wide management cost (Table 5)			70,000
Estimated Gilutongan marine sanctuary costs (Table 5)			21,000
Actual Coastal Resource Management Project investment			65,000

- 1 Assumes current status of Olango-reef and habitat and based on calculations derived in Tables 3, 4, and 5 above; when a range is given, the mid-point is used
- 2 Potential net annual revenues with coastal resource management interventions in place after five full years of operation
 - a. Assumes that reef and mangrove management can increase fish catch by 100 percent over five years through a series of marine sanctuaries and improved law enforcement efforts
 - b. Assumes that reef and wetland management will increase the number of visitors by 50 percent over five years
 - c. Assumes reef management will not significantly affect seaweed farming production
 - d. Not quantified
 - e. Assumes each visitor pays a fee of US\$3 for entrance fees based on willingness-to-pay surveys (Arin 1998) and new legislation supporting user fees
 - f. Assumes no significant change in wood production from mangroves

One basic assumption of the above analysis is that the island coral reefs and wetlands will at least be maintained and will not deteriorate. The Olango area is targeted for tourism development with the assumption that the quality of the environment will improve. This is important in that the area has a reputation for illegal fishing and overexploited reef resources. The investment in management needs to be scaled up to reverse these trends and to bring back the quality of the environment. The graph shown in Figure 2 highlights the accrual of incremental benefits resulting from management of the resources compared to the estimated cost of management over a ten-year period. The incremental benefits, although based on conservative assumptions about tourism growth, show that investments in management are more than covered by the net revenues from the natural resource base for fisheries and as an attraction for tourists.

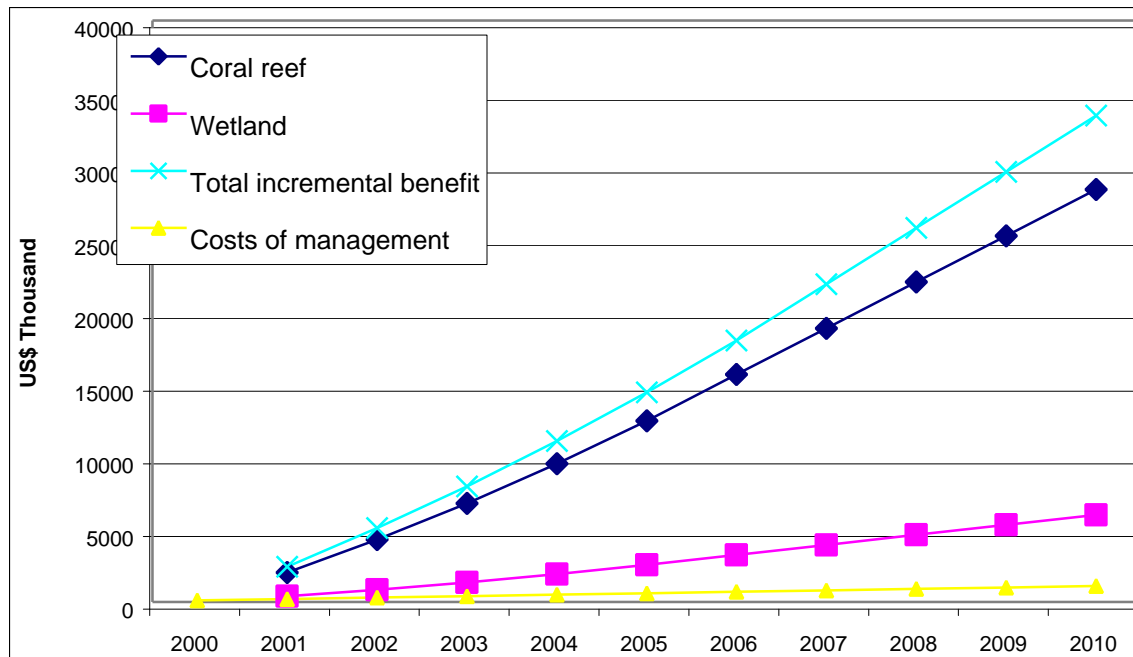


Figure 2. Accrued incremental benefits compared to costs of management from the sustainable use of Olango Island resources

5.2 Benefits by unit area of habitat and sensitivity to improved management

The local governments may not be able to support such a large investment as the CRMP has contributed on an annual basis, but the analysis clearly shows that it is to their overall economic benefit to increase investment more in coastal resource management. If we assume that no investment is made and business as usual prevails with overfishing and degradation worsening, there will be a continued decline of the coastal resources upon which Olango Island communities depend. It would also lead to a decline in the off-island tourism industry based on Mactan Island. One way to illustrate this effect is to look at the potential for increased revenue from improved and intensely managed reef areas such as the Giluntongan marine sanctuary. This sanctuary reef area is visited by up to 100 divers per day and if management improves, with implementation of anchor facilities, mooring fees and other regulations, it will produce much more revenue than the average reef area of Olango Island. A quick calculation shows that about US\$200,000 annual net revenues can be generated from the marine sanctuary, if properly managed. Figure 3 indicates the levels of net revenue possible from the resources of Olango Island by unit area. If the quality of the resource base improves, so will revenues in the long-term to all concerned, on and off the island.

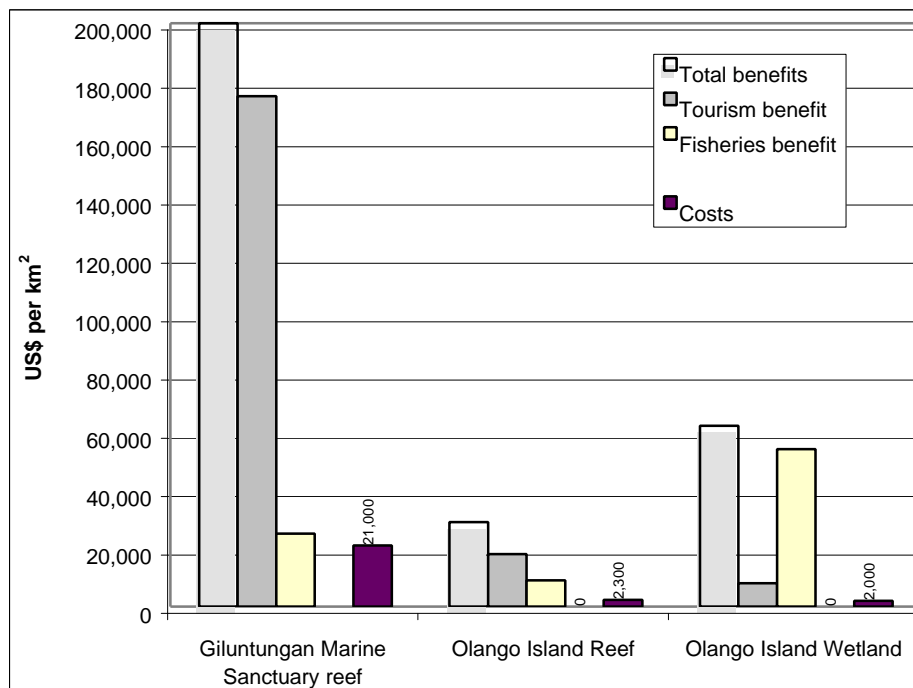


Figure 3. Incremental benefits from Olango Island resource use per km² for different management regimes and the cost of management

6. CONCLUSIONS

It is apparent from this analysis that local and national government in the Philippines can justify larger allocations of their annual budgets in managing coastal resources. Olango Island is a microcosm of the Philippines where the coastal natural resource base holds much potential to improve the incomes and quality of life of people if only it is protected and managed for sustainable use. The benefit/cost returns of about 15:1 from Gilutungan Island Marine Sanctuary and about 30:1 for the whole of Olango Island are impressive. These benefit cost ratios assume increasing investment in management of coastal resources. Unfortunately such management is not immediately forthcoming and requires expertise, dedicated people and programs. These costs can all be justified in economic terms as for Olango Island where the annual incremental benefits from coral reef and wetland generated fisheries and tourism of US\$1.4 million are much more than the associated costs.

The economic benefits from coastal resource management in Olango almost all accrue to the local residents and businesses. It is hoped that this analysis will encourage more such investment on the part of the local governments and private sector groups.

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